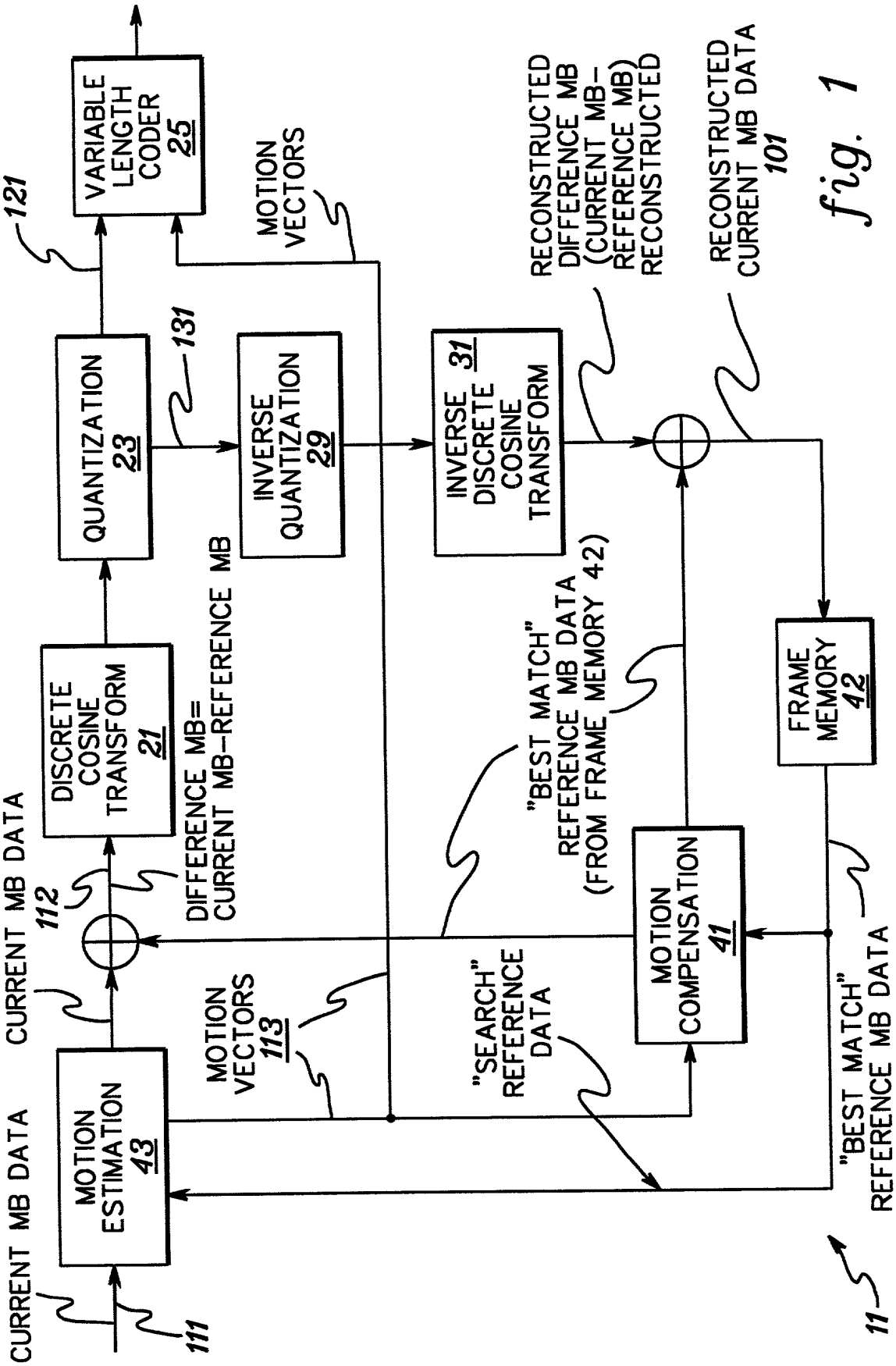
CURRENT MB DATA
111
MOTION ESTIMATION 43
MOTION VECTORS 113
CURRENT MB DATA 112
DISCRETE COSINE TRANSFORM 21
DIFFERENCE MB= CURRENT MB-REFERENCE MB
QUANTIZATION 23
121
131
VARIABLE LENGTH CODER 25
MOTION VECTORS
INVERSE QUANTIZATION 29
INVERSE DISCRETE COSINE TRANSFORM 31
RECONSTRUCTED DIFFERENCE MB (CURRENT MB-REFERENCE MB) RECONSTRUCTED
RECONSTRUCTED CURRENT MB DATA 101
"BEST MATCH" REFERENCE MB DATA (FROM FRAME MEMORY 42)
"SEARCH" REFERENCE DATA
MOTION COMPENSATION 41
FRAME MEMORY 42
"BEST MATCH" REFERENCE MB DATA
11

fig. 1

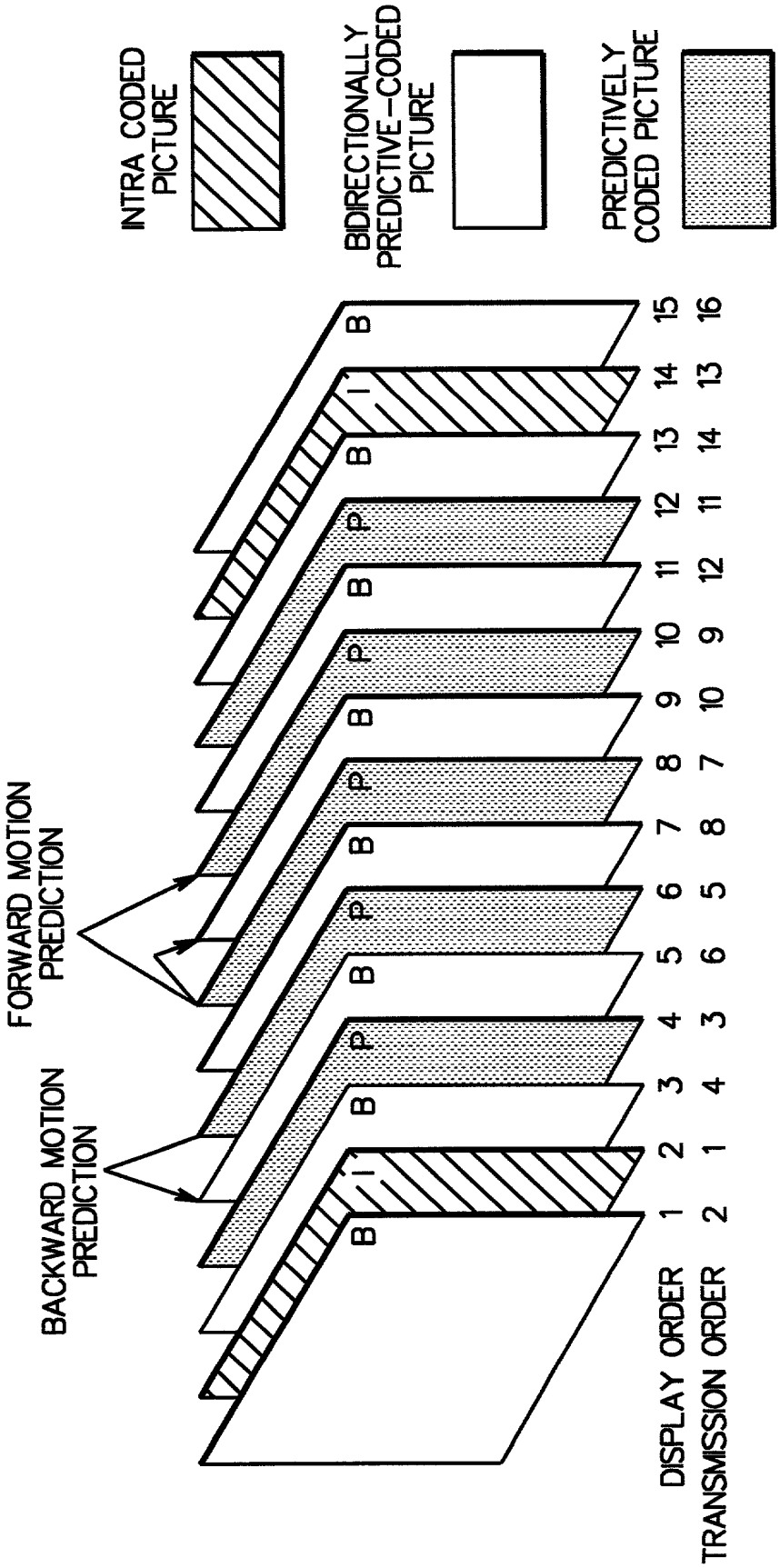
INTRA CODED PICTURE
BIDIRECTIONALLY PREDICTIVE-CODED PICTURE
PREDICTIVELY CODED PICTURE
FORWARD MOTION PREDICTION
BACKWARD MOTION PREDICTION
I B P B P B P B P B I B P B
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
DISPLAY ORDER
2 1 4 3 6 5 8 7 10 9 12 11 14 13 16 15
TRANSMISSION ORDER

fig. 2

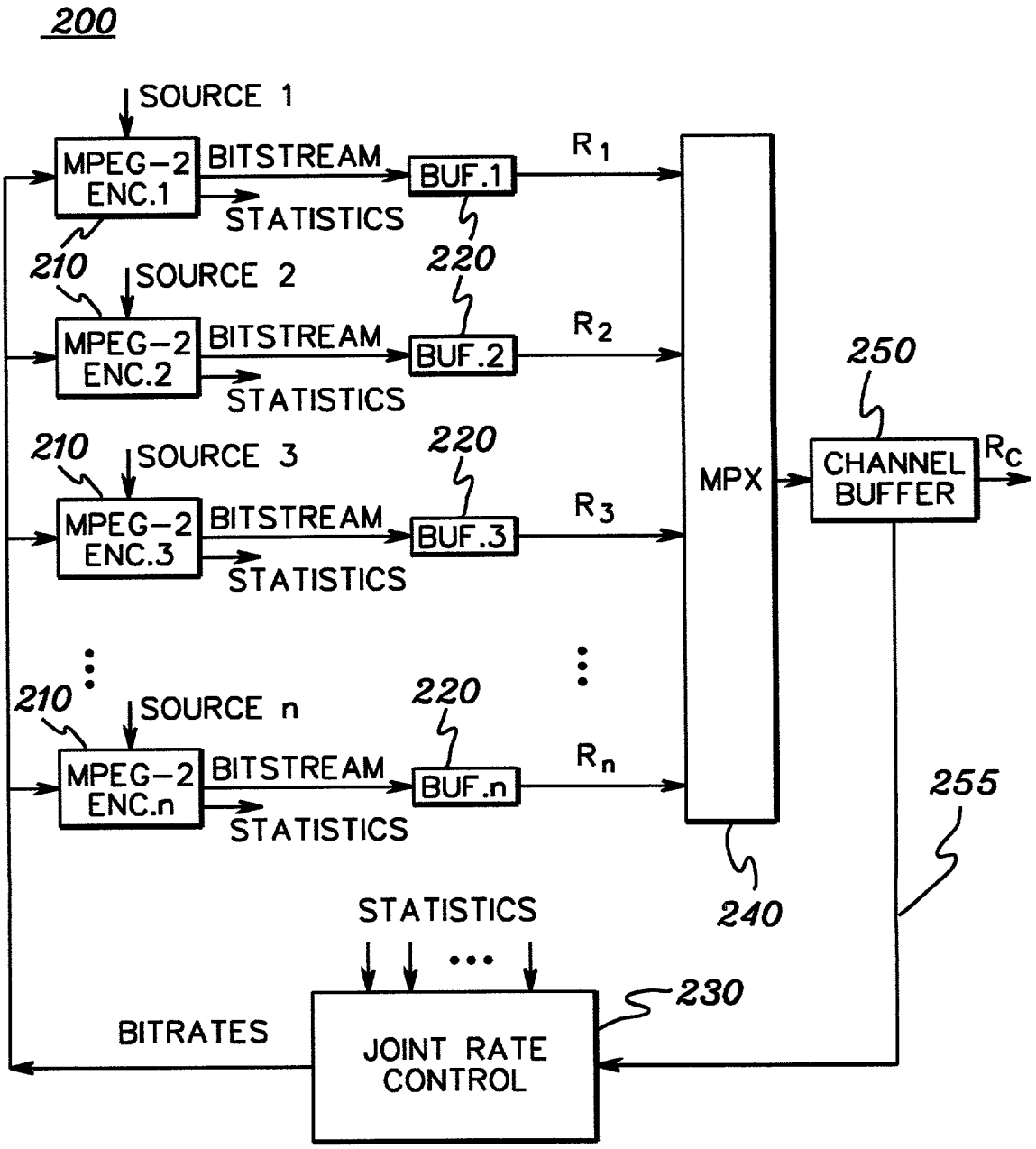
200
SOURCE 1
MPEG-2 ENC.1
BITSTREAM
STATISTICS
BUF.1
R_1
210
220
SOURCE 2
MPEG-2 ENC.2
BITSTREAM
STATISTICS
BUF.2
R_2
250
210
220
SOURCE 3
MPEG-2 ENC.3
BITSTREAM
STATISTICS
BUF.3
R_3
MPX
CHANNEL BUFFER
R_C
210
220
SOURCE n
MPEG-2 ENC.n
BITSTREAM
STATISTICS
BUF.n
R_n
255
240
STATISTICS
230
BITRATES
JOINT RATE CONTROL

fig. 3

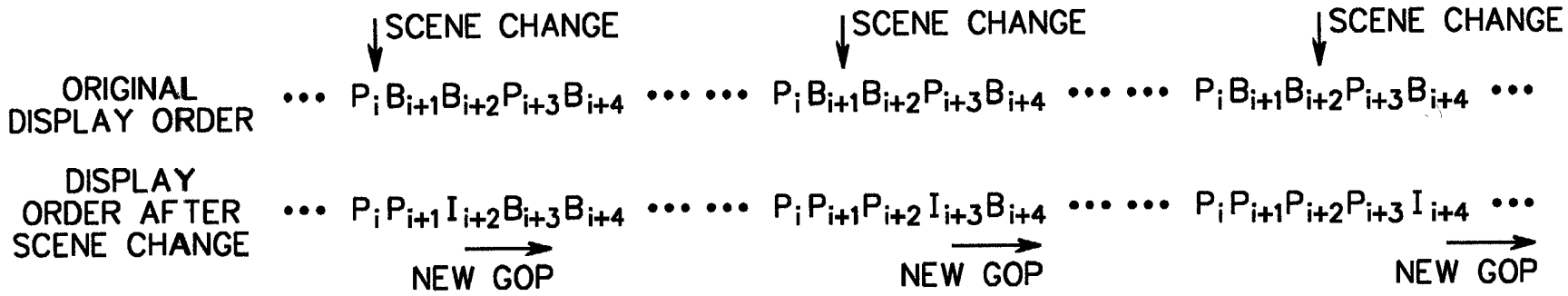
SCENE CHANGE
SCENE CHANGE
SCENE CHANGE
ORIGINAL DISPLAY ORDER
DISPLAY ORDER AFTER SCENE CHANGE
NEW GOP
NEW GOP
NEW GOP

fig. 4

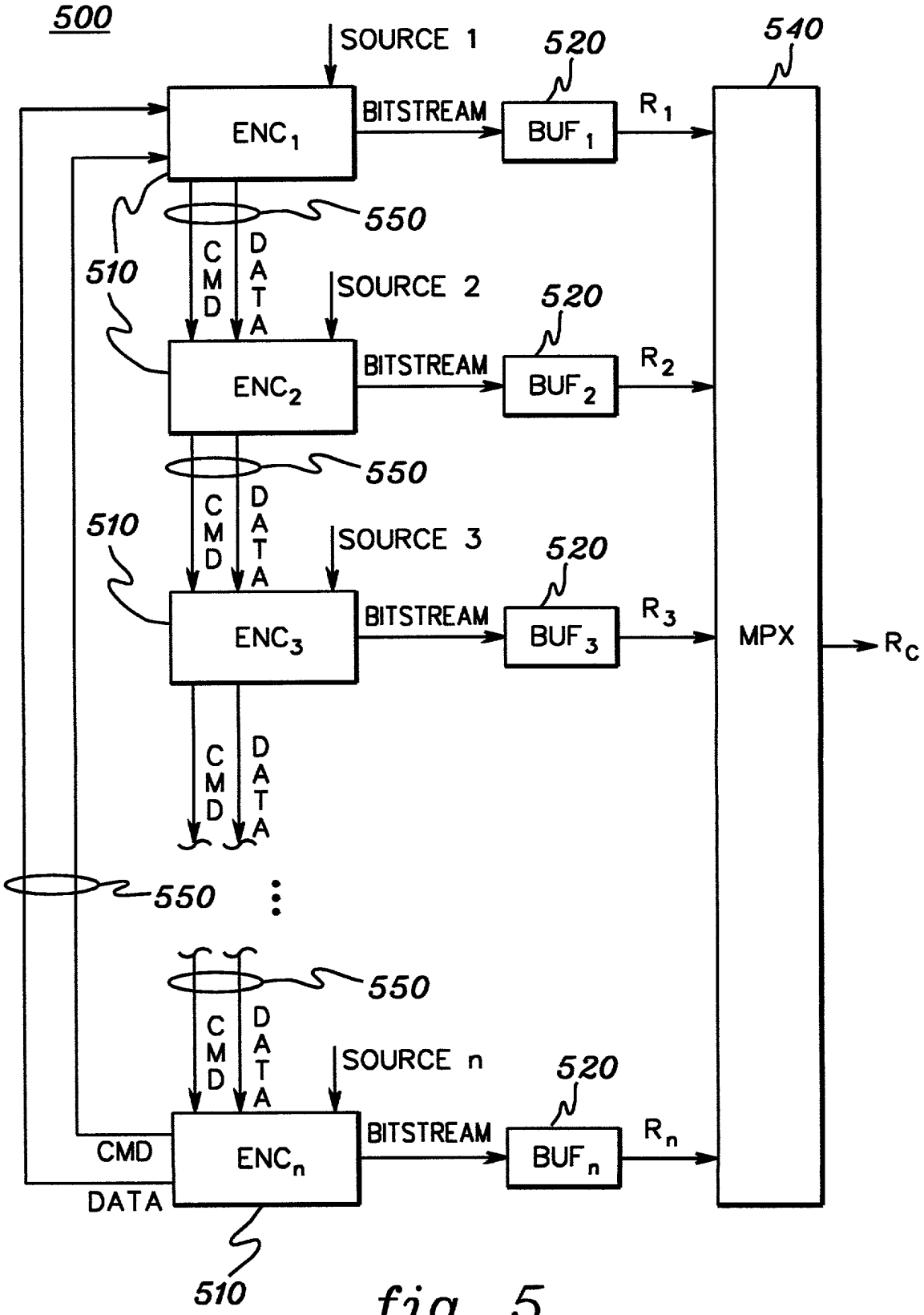
500
SOURCE 1
520
540
ENC1
BITSTREAM
BUF1
R1
550
510
CMD
DATA
SOURCE 2
520
ENC2
BITSTREAM
BUF2
R2
550
510
CMD
DATA
SOURCE 3
520
ENC3
BITSTREAM
BUF3
R3
MPX
RC
CMD
DATA
550
550
CMD
DATA
SOURCE n
520
CMD
DATA
ENCn
BITSTREAM
BUFn
Rn
510

fig. 5

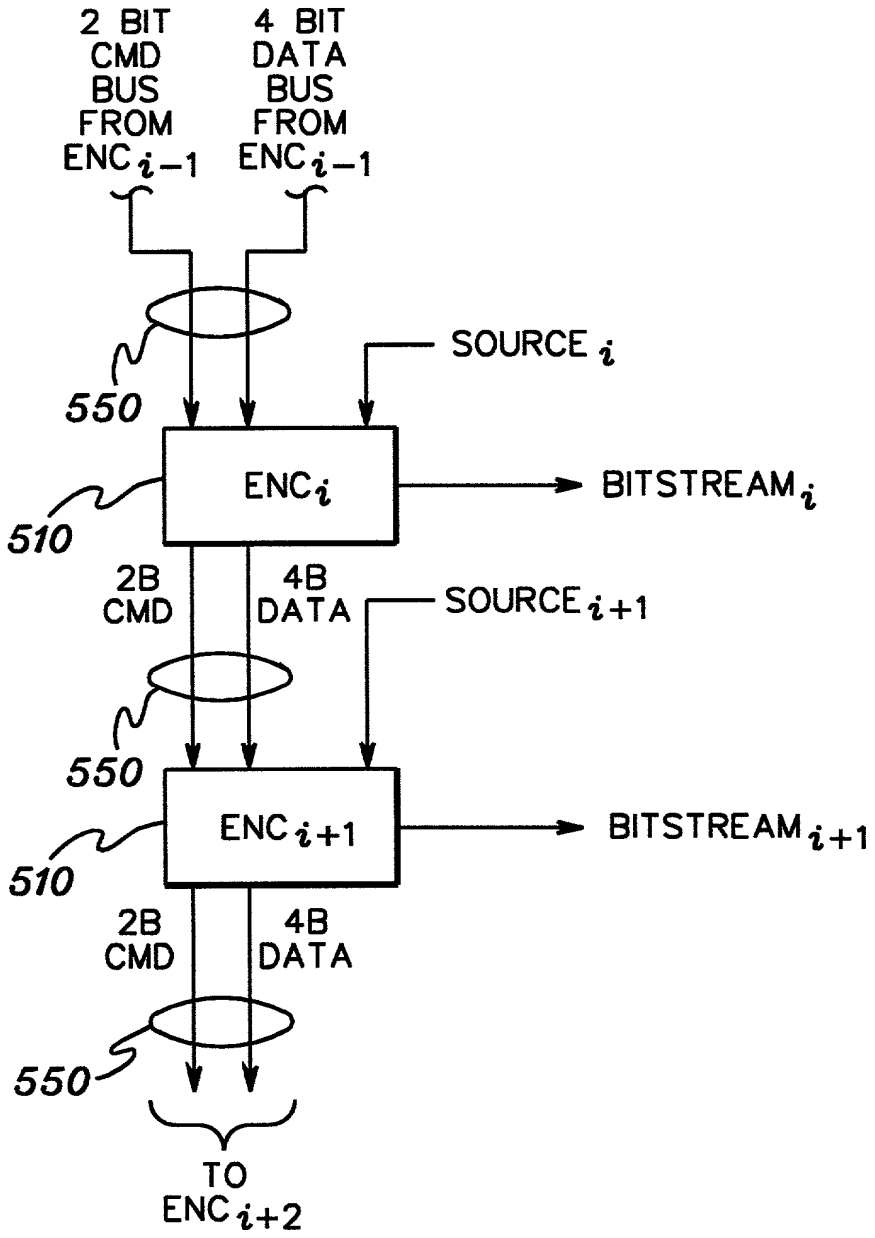
2 BIT CMD BUS FROM ENC$_{i-1}$
4 BIT DATA BUS FROM ENC$_{i-1}$
550
SOURCE $_i$
ENC$_i$
510
BITSTREAM$_i$
2B CMD
4B DATA
SOURCE$_{i+1}$
550
ENC$_{i+1}$
510
BITSTREAM$_{i+1}$
2B CMD
4B DATA
550
TO ENC$_{i+2}$

fig. 6

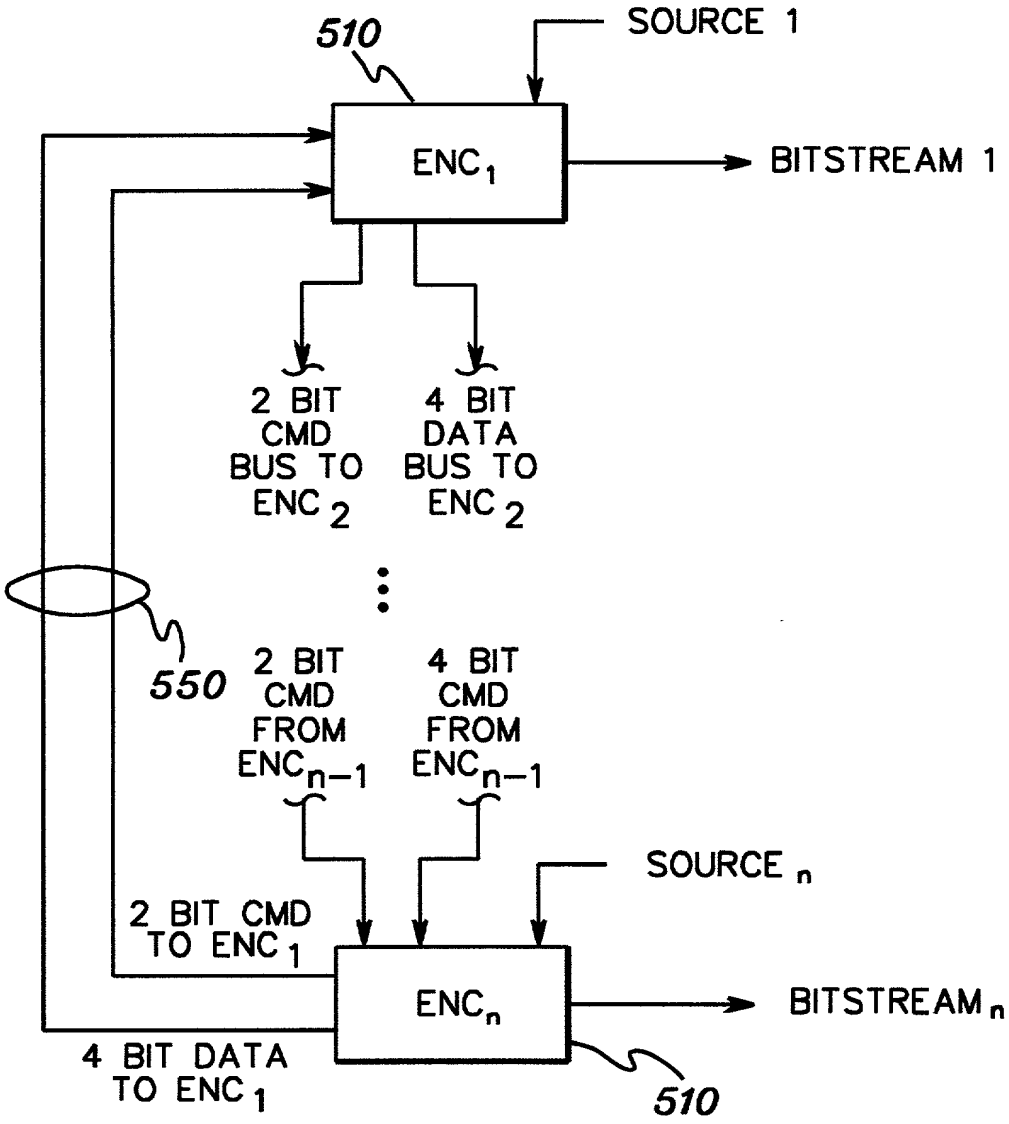
510
SOURCE 1
ENC1
BITSTREAM 1
2 BIT CMD BUS TO ENC 2
4 BIT DATA BUS TO ENC 2
550
2 BIT CMD FROM ENCn−1
4 BIT CMD FROM ENCn−1
SOURCE n
2 BIT CMD TO ENC 1
ENCn
BITSTREAMn
4 BIT DATA TO ENC 1
510

fig. 7

KEY FOR FIG. 8B

i	ENCODER INDEX. (1 THRU n)
n	INDEX OF LAST ENCODER IN SYSTEM
SUM	CONTROL WORD WRITTEN TO COMMAND (CMD) BUS SIGNALING THE SUMMING OF THE VALUE BEING PASSED
TOTAL	CONTROL WORD WRITTEN TO CMD BUS SIGNALING THE TORAL OF THE VALUE BEING PASSED
V	VALUE READ FROM THE DATA BUS
V_i	VALUE CALCULATED BY EACH INDIVIDUAL ENCODER$_i$
V_{SND}	VALUE WRITTEN TO DATA BUS
V_T	TOTAL VALUE (SAVED BY ENC$_i$)
==	MEANS EQUAL TO
=	MEANS IS BEING ASSIGNED THE VALUE OF

fig. 8A

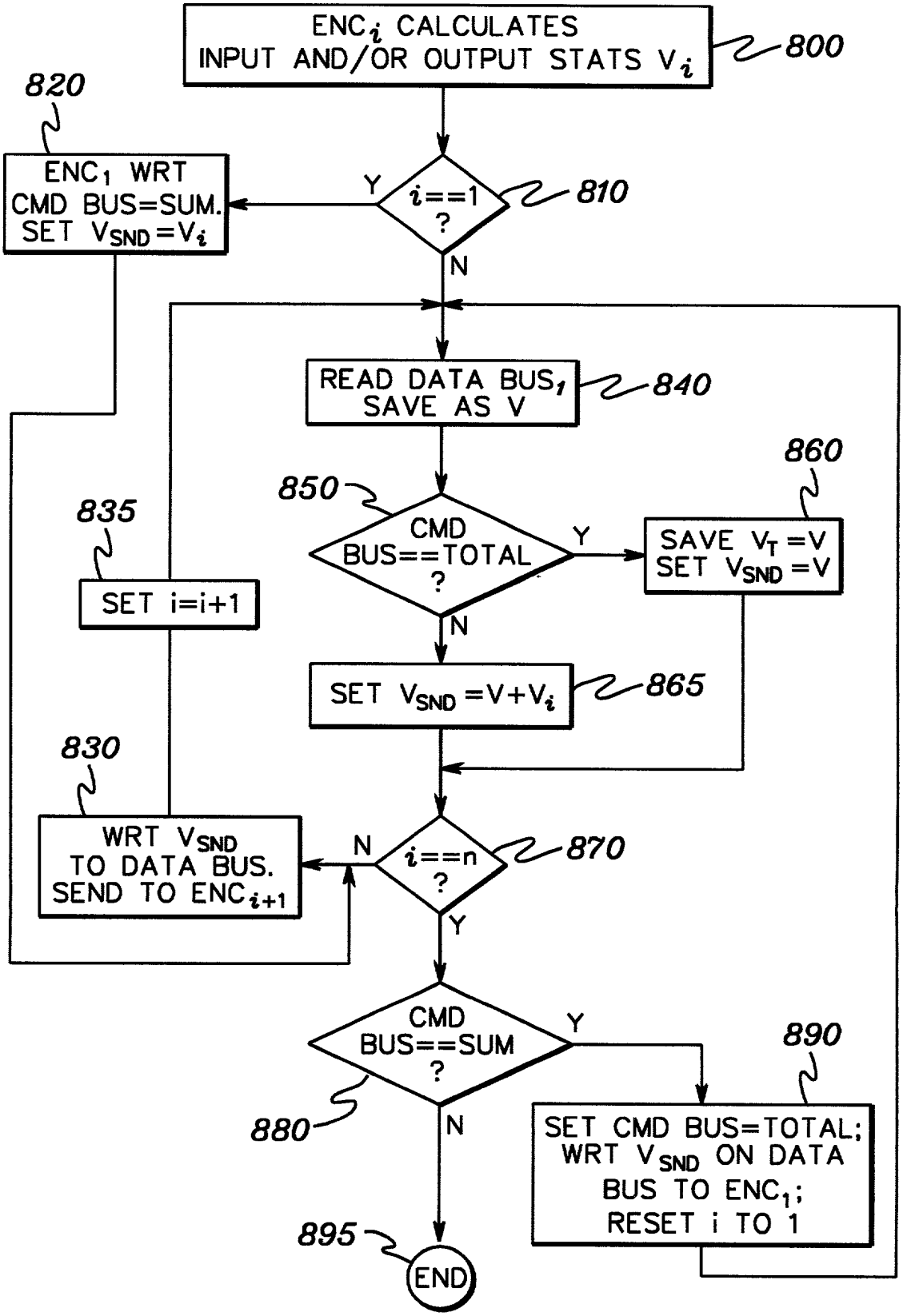
ENC$_i$ CALCULATES INPUT AND/OR OUTPUT STATS V_i
800
820
ENC$_1$ WRT CMD BUS=SUM. SET $V_{SND}=V_i$
Y
i==1 ?
810
N
READ DATA BUS$_1$ SAVE AS V
840
860
850
CMD BUS==TOTAL ?
Y
SAVE $V_T=V$ SET $V_{SND}=V$
835
SET i=i+1
N
SET $V_{SND}=V+V_i$
865
830
WRT V_{SND} TO DATA BUS. SEND TO ENC$_{i+1}$
N
i==n ?
870
Y
CMD BUS==SUM ?
Y
890
880
N
SET CMD BUS=TOTAL; WRT V_{SND} ON DATA BUS TO ENC$_1$; RESET i TO 1
895
END

fig. 8B

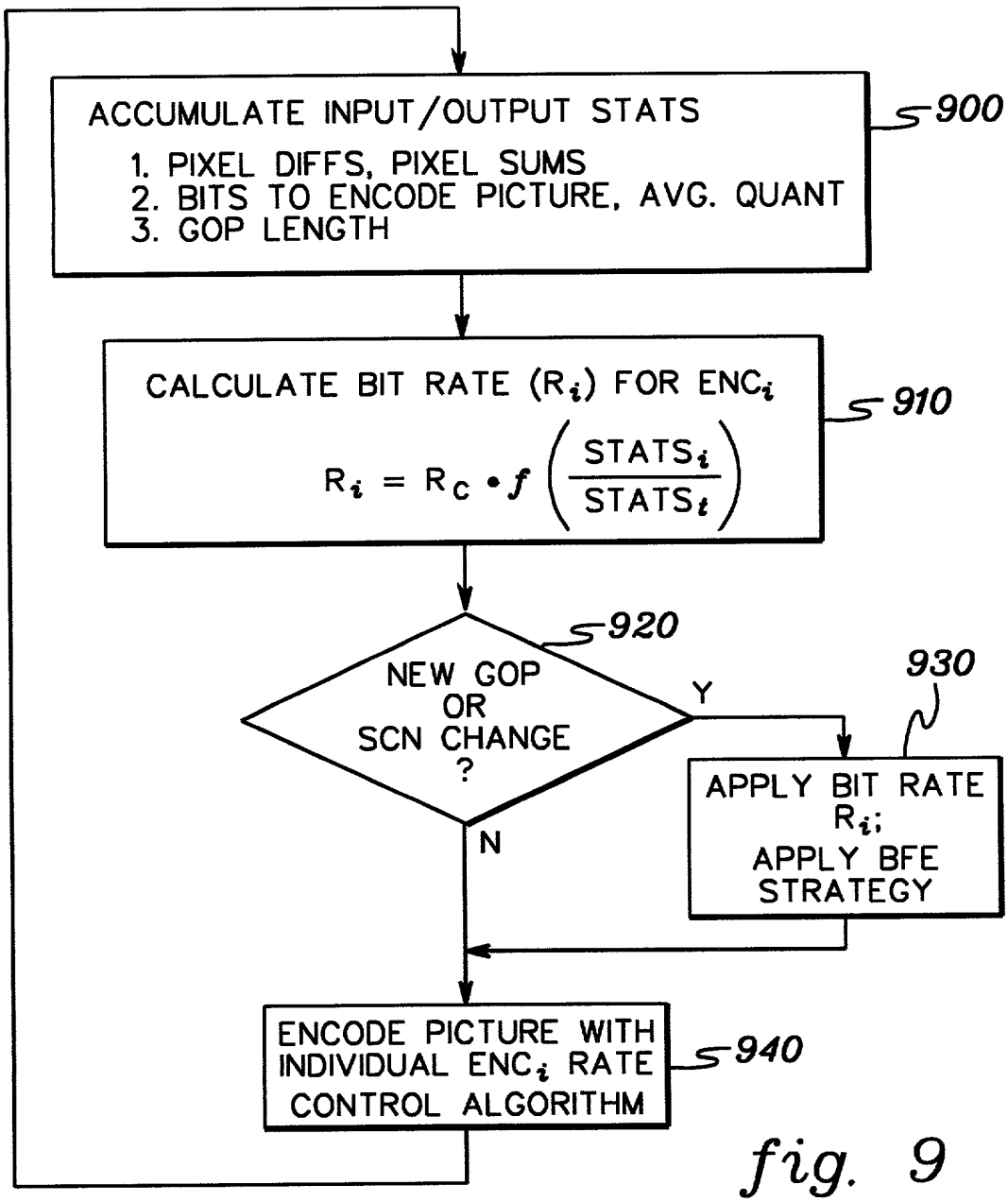
ACCUMULATE INPUT/OUTPUT STATS
1. PIXEL DIFFS, PIXEL SUMS
2. BITS TO ENCODE PICTURE, AVG. QUANT
3. GOP LENGTH
900
CALCULATE BIT RATE (R_i) FOR ENC_i
$R_i = R_C \cdot f\left(\frac{STATS_i}{STATS_t}\right)$
910
NEW GOP OR SCN CHANGE ?
920
Y
N
930
APPLY BIT RATE R_i; APPLY BFE STRATEGY
ENCODE PICTURE WITH INDIVIDUAL ENC_i RATE CONTROL ALGORITHM
940

fig. 9

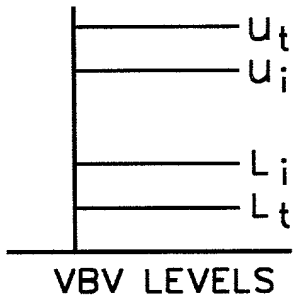
u_t
u_i
L_i
L_t
VBV LEVELS

fig. 10